

1 TO WHOM IT MAY CONCERN:

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3 BE IT KNOWN THAT WE, LI-MING CHENG, a citizen
4 of Taiwan, residing in Kaohsiung, in the Country of
5 Taiwan, and LAWRENCE S. WU, a citizen of the United
6 States of America, residing in Rowland Heights, in the
7 County of Los Angeles, State of California, have
8 invented a new and useful improvement in

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11 PULL DOWN, PUSH UP, SHADE ASSEMBLY

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BACKGROUND OF THE INVENTION

This application is a continuation-in-part of prior pending U.S. patent application serial number 10/360,305, filed February 10, 2003.

This invention relates generally to window shade control, and more particularly to simplification in raising and lowering pleated window shades without requiring manipulation of a cord or cords hanging downwardly from an upper support or rail member.

The use of hanging cords requiring manual manipulation has been thought to be required for the raising and lowering of window shades, and particularly pleated shades. Such cords are frequently difficult to operate correctly, and their use can result in inaccurate or unwanted shade movement, as well as risk of entanglement with small children, and possible strangulation. There is need for a cordless and pleated window shade assembly which can be easily operated as by simply exerting up or down light force on the lower hanging portion of the assembly.

There is also need for a pleated window shade assembly that is easily operated, and can be automatically kept level, upon adjustment at one location.

1 entrain said secondary line or lines about said dual
2 rotary members, for storage on at least one of the
3 members.

4 It is another object of the invention to
5 provide a spring, as referred to, which has S-shaped
6 configuration, whereby the spring winds in a clockwise
7 direction about one of said members, and in a
8 counterclockwise direction about the other of said
9 members. As will be seen, at least one member has
10 coaxial first and second surface portions, the spring
11 winding about the first portion, and the secondary line
12 winding about the second portion. Typically, each of
13 the members has coaxial first and second surface
14 portions, the spring winding about the first portion
15 and the secondary line or lines winding about the
16 second portion. The spring acts as a shade balancing
17 spring, to hold the shade in any selected vertical
18 position.

19 Yet another object includes provision of a
20 housing, and posts in the housing supporting the
21 members for free rotation about axes defined by the
22 posts. Annular caps may be associated with the posts
23 and members, for axially positioning the members in the
24 housing. The latter is typically defined by a portion
25 of said upper elongated support which is a shade head
26 rail.

1 A further object includes the provision of
2 means acting on the above defined secondary line or
3 lines for counterbalancing suspension force exerted on
4 said primary lines at different shade height adjusted
5 levels, said means including a dual rotary member
6 entraining said secondary line, and a spring
7 operatively connected to said dual rotary members. As
8 referred to, that spring may advantageously have S-
9 shaped, flat surface configuration.

10 It is another object of the invention to
11 provide a rotary member exerting tensioning force on
12 the secondary line or lines; to provide a rotary member
13 exerting tensioning force on that secondary line or
14 lines; and to provide a number of such secondary line
15 or lines less than the number of said primary lines,
16 whereby, the rotary member of small dimension is able
17 to controllably store a maximum number of windings,
18 within the confines of a reduced dimension upper
19 support member, such as a channel configured rail.

20 It is yet another object of the invention to
21 provide a path of travel for the defined line
22 connection or interconnection, which extends lengthwise
23 of the upper support, and which does not pass over any
24 rotors, and whereby possible derailment of that
25 connection by a rotor is prevented. In this respect,
26 the primary rotors preferably include a first rotor

1 having spacing from said counterbalancing means which
2 exceeds said path of travel, for shade height
3 adjustment between uppermost and lowermost positions.

4 Further, the primary rotors may typically
5 include at least one second rotor over which said
6 primary lines are entrained, and the primary rotors
7 including a third rotor in the form of a pulley over
8 which one of the primary lines is entrained, and a
9 fourth rotor in the form of a pulley over which another
10 of the primary lines is entrained.

11 Yet another object includes containment by
12 the upper support of all of the primary rotors and the
13 tensioning means; the provision of primary lines that
14 have first terminals operatively connected to said
15 lower elongated member, below said upper support; and
16 wherein the primary lines have second terminals
17 operatively connected to said connection, within said
18 upper support.

19 A further object is to provide a tensioning
20 means that includes a device for locking said secondary
21 line in a selected position or positions corresponding
22 to selected shade height adjustment. In this regard,
23 the secondary line may have an extension that hangs
24 below the level of said device, for manual grasping and
25 control of locking by said device.

1 An additional object is provision of a
2 fastener or fasteners to attach the upper elongated
3 support to structure above the levels of said rotors
4 and secondary line, said fastener or fasteners being
5 one of the following:

- 6 i) a spacer portion to positively
7 locate the elongated support spaced
8 below said structure,
- 9 ii) a hinged portion to positively
10 locate the elongated support below
11 upright wall to which the hinged
12 portion is attachable.

13 These and other objects and advantages of the
14 invention, as well as the details of an illustrative
15 embodiment, will be more fully understood from the
16 following specification and drawings, in which:

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18 **DRAWING DESCRIPTION**

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20 Fig. 1 is an elevational view of an improved
21 shade assembly incorporating the invention;

22 Fig. 2 is an end view of the shade assembly;

23 Fig. 3 is a view like Fig. 1, showing the
24 assembly of the invention, no external pull cords being
25 visible;

1 simply manually adjusted up or down, as indicated by
2 arrows 14 and 15. Shade pleats 16 are located between
3 and connected to 12 and 13, as shown. The pleats are
4 foldable, and expand or separate as member 13 is urged
5 downwardly, to selectively adjusted height position,
6 for example controllably covering a window. See for
7 example Fig. 2. The pleats collapse toward one another
8 as the member 13 is elevated toward 12, to another
9 adjusted position or positions. Pleats expand as at
10 60, from stacked positions as at 61. See also Fig. 2.

11 Primary lines or cords are provided to extend
12 generally vertically through the pleats, as seen in
13 Fig. 2, to suspend the lower member 13. See for
14 example two lines 20 and 21, connected at their lower
15 ends or terminals 20a and 21a to member 13, at
16 laterally spaced positions. Two such lines are shown,
17 but three may be provided, as for a larger width shade.

18 Primary rotors are provided at the upper
19 support or rail 11, to entrain the primary lines, and
20 guide them toward a common connection 22 with at least
21 one secondary line 24 which moves endwise relative to
22 12 as connection 22 is moved endwise. The number of
23 secondary lines is less than the number of primary
24 lines, for reasons as will appear. Typically, there is
25 only one secondary line 24, and two or more primary
26 lines, such as lines 20 and 21. In that event,

1 connection 22 connects the terminals of lines 20 and 21
2 with the terminal of line 24, whereby movement of that
3 connection 22 and line 24 in one direction tends to
4 equally raise primary line terminals 20a and 21a; and
5 movement of connection 22 and line 24 in the opposite
6 direction tends to equally lower primary line terminals
7 20a and 21a, the lower member thereby being maintained
8 in horizontal condition as it is raised and lowered.

9 Means is provided for acting on the secondary
10 line or lines 24 for exerting force counterbalancing
11 the suspension force exerted on the primary lines, by
12 the weight of the lower member 13, and pleats, as at
13 different shade height adjusted levels. Such
14 counterbalancing force enables stable suspension of the
15 lower member 13 at any vertical position to which it is
16 raised or lowered. Such means is generally indicated
17 at 30 in Figs. 1 and 4 and may take different forms,
18 but preferably enabling its reception as shown within
19 the confining channel shaped support 11, as near one
20 end thereof. Means 30 may include a housing 30a, and a
21 tension exerting torsion spring element 32 within 30a.
22 The line 24 is typically wound onto or off a spool or
23 drum 33 within 30a, and spring force is exerted on the
24 spool in a line winding direction, to provide the
25 counterbalancing force or tension referred to. That
26 force is maintained as the shade is raised or lowered

1 to stable adjusted position, and static friction may be
2 provided in the means 30 acting to hold the lower
3 member at selected height adjustment. Such friction
4 may be supplied by drum 32 rubbing against the housing.
5 Since only one line 24 is typically spooled at 33, the
6 size of the spool may be minimized to fit within
7 channel 12. A guide pulley 50 directs travel of line
8 24 to and from the winding area of the spool. Pulley
9 50 is axially slidable along axle 50a, perpendicular to
10 line 24, to follow or guide the line 24 as it is wound
11 on and off drum 33.

12 In the primary rotor system illustrated a
13 first rotor 40 may have spacing from the tensioning
14 means 30 such that the lengthwise path of travel
15 indicated by dimension 90 of connection 22 does not
16 pass over any primary rotor, or pulleys, such as first
17 rotor 40, thereby eliminating risk of entanglement or
18 'hang-up' of connection 22 with rotor structures. In
19 this regard, first rotor 40 is shown as having spacing
20 from said means 30 which exceeds said path of travel,
21 for shade height adjustment between uppermost and
22 lowermost positions.

23 As shown, the primary rotors include at least
24 one second rotor over which said primary lines are
25 entrained, and the primary rotors include a third rotor
26 in the form of a pulley over which one of said primary

1 lines is entrained, and a fourth rotor in the form of a
2 pulley over which another of said primary lines (line
3 21) is entrained.

4 See for example the following:

- 5 - second rotor 46, (for example near 50)
- 6 - third rotor 47
- 7 - fourth rotor 48.

8 All of such rotors are contained within the
9 channel shaped support 11. Lines 20 and 21 project
10 downwardly through lower extent of support 11. Rotor
11 46 is between 50 and 47, so that both lines 20 and 21
12 may be redirected by like idler rotors 47 and 48, for
13 like vertical control of lines 20 and 21, enhancing
14 maintenance of slat 13 in horizontal condition.

15 In Fig. 5, the assembly or apparatus 10 is
16 installed at a window 112 bordered by a frame 111. The
17 latter has horizontal and vertical frame members 113-
18 116, as shown. Support 11 is attached to upper
19 horizontal frame member 113.

20 Referring now to the modification seen in
21 Fig. 6, elements corresponding to elements of Fig. 1
22 are given corresponding identification numerals. In
23 Fig. 6, rotors 40 and 46 are located at the same
24 general position along 11; and this is enabled by
25 providing an idler rotor 42 carried by 11, and over
26 which primary lines 20 and 21 extend or are entrained,

1 as shown. Idler rollers or rotors 47 and 48 are
2 located along the length of 11, and between 42 and 46.

3 Secondary line 24 extends to the means 133
4 acting on 24 for counter-balancing suspension force
5 exerted on the primary lines 20 and 21, as at different
6 shade height adjustment levels. In this instance, the
7 means 133 is a device for locking the secondary line 24
8 in a selected position or positions corresponding to
9 selected shade height adjustment. In this example,
10 line 24 has an extension 24a that hangs below the level
11 of said device, for manual grasping and control of
12 locking by said device. The user can control the
13 locking or unlocking status of means 133 by varying the
14 angularity of pull on single line 24a, and thereby
15 control the positions of two lines 20 and 21 that
16 control shade height and bottom level.

17 In accordance with an additional feature or
18 features of the invention, a fastener or fasteners is
19 or are provided to attach the upper elongated support
20 to structure above the levels of said rotors and
21 secondary line, said fastener or fasteners being one of
22 the following:

- 23 i) a spacer portion to positively
24 locate the elongated support spaced
25 below said structure,

1 ii) a hinged portion to positively
2 locate the elongated support below
3 upright wall to which the hinged
4 portion is attachable.

5 Figs. 6 and 7 show two such fasteners 160
6 having middle spacer portion 161 to positively locate
7 elongated support lower wall 11a at a predetermined
8 fixed distance below the window frame upper member 113.
9 For this purpose, a lower flange 162 on 160 engages
10 lower wall 11a, and an upper flange 163 on 160 engages
11 the underside 113a of member 113. A retainer screw 164
12 extends through 160 and connects to 113.

13 In Fig. 8, the illustrated hinged portion 170
14 has a first component 171 to attach to the upper wall
15 11b of the elongated support; and a second component
16 172 to swing upwardly and attach by fastener or
17 fasteners 173 to upright wall 174 on or near the
18 window frame.

19 Components 171 and 172 are hingedly connected
20 together at 175 to form an L-shaped positive support
21 when 172 is swung upwardly to position 172a.

22 In Figs. 9 and 10, a modified means is shown
23 acting on the secondary line or lines 24 for
24 counterbalancing suspension force exerted on the
25 primary lines 20 and 21, at different shade height
26 adjustment levels. The modified means, as shown,

1 includes dual rotary members 80 and 81 exerting
2 tensioning force on the secondary line 24, that line 24
3 being entrained or wound about the dual entry members,
4 for line storage, as the shade is raised or lowered.

5 The referenced counterbalancing means
6 includes a spring coupled to said dual rotary members
7 and exerting force tending to entrain said secondary
8 line or lines about said dual rotary members, for
9 storage on at least one of the members. See for
10 example the spring 83 which has S-shaped configuration,
11 so as to wind or coil at 83a in a clockwise direction
12 about a first portion 80a of member 80, and so as to
13 wind or coil at 83b in a counterclockwise direction
14 about a first portion 81a of rotary member 81. The
15 secondary line 24 winds at 24a about a second portion
16 80b of the member 80, and at 24b about a second portion
17 81b of member 81, as shown. Portions 80a and 80b are
18 coaxial, and portions 81a and 81b are coaxial, as
19 shown.

20 Note in Fig. 10 the attachment of spring end
21 83c to member 80, as for example by means of a fastener
22 or set screw 84; and the attachment of spring end 83d
23 to member 81, as by means of fastener or set screw 85.
24 The spring ends may be attached to the two members as
25 by other means, such as bonding, or by spring end
26 turning into grooves in the members.

1 Fig. 9 also shows a housing 86 that includes
2 a receptacle 86a and a cover 86b. Posts 87a and 87b
3 attached to the plate 86b extend in parallel relation
4 through bores 80e and 81e in the rotary members, to
5 mount those members for rotation. Caps 87-90 position
6 the members 80 and 81 and the spring, for endwise back
7 and forth operation of line 24, through opening 91 in
8 the receptacle, with spring tension balancing the
9 weight of the hanging shade, at any selected height
10 position, whereby the shade remains in selected height
11 position. Receptacle 86a is typically a part of the
12 head rail 12.

13 In Figs. 9 and 10, the coiling of the spring
14 about 81a increases as the shade is pulled down. This
15 decreases spring coiling about 80a. Conversely, the
16 coiling of the spring about 80a increases as the shade
17 is moved up. This decreases spring coiling about 81a.
18 In this way, the spring acts as a force balancing
19 device to maintain the shade at any selected elevation.

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